

# Fertiliser use, soil responsiveness and yield gaps in cotton-based cropping systems of N Cameroon



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CIRAD-Persyst

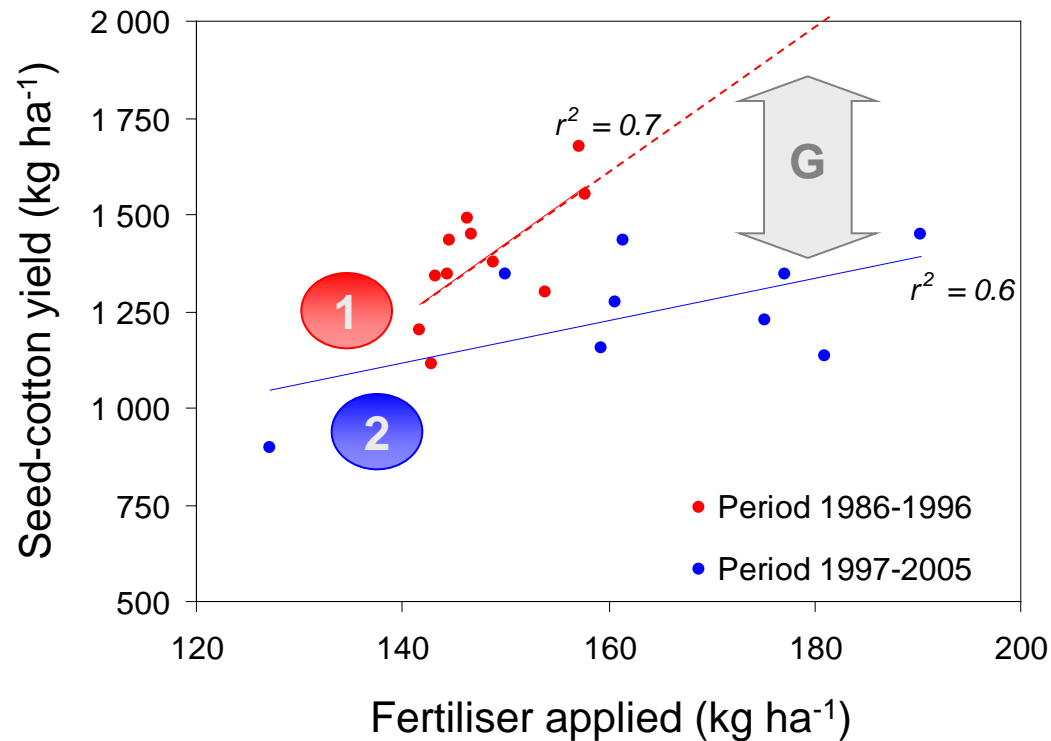
*Yield Gap Symposium, AGRO 2010 Montpellier*

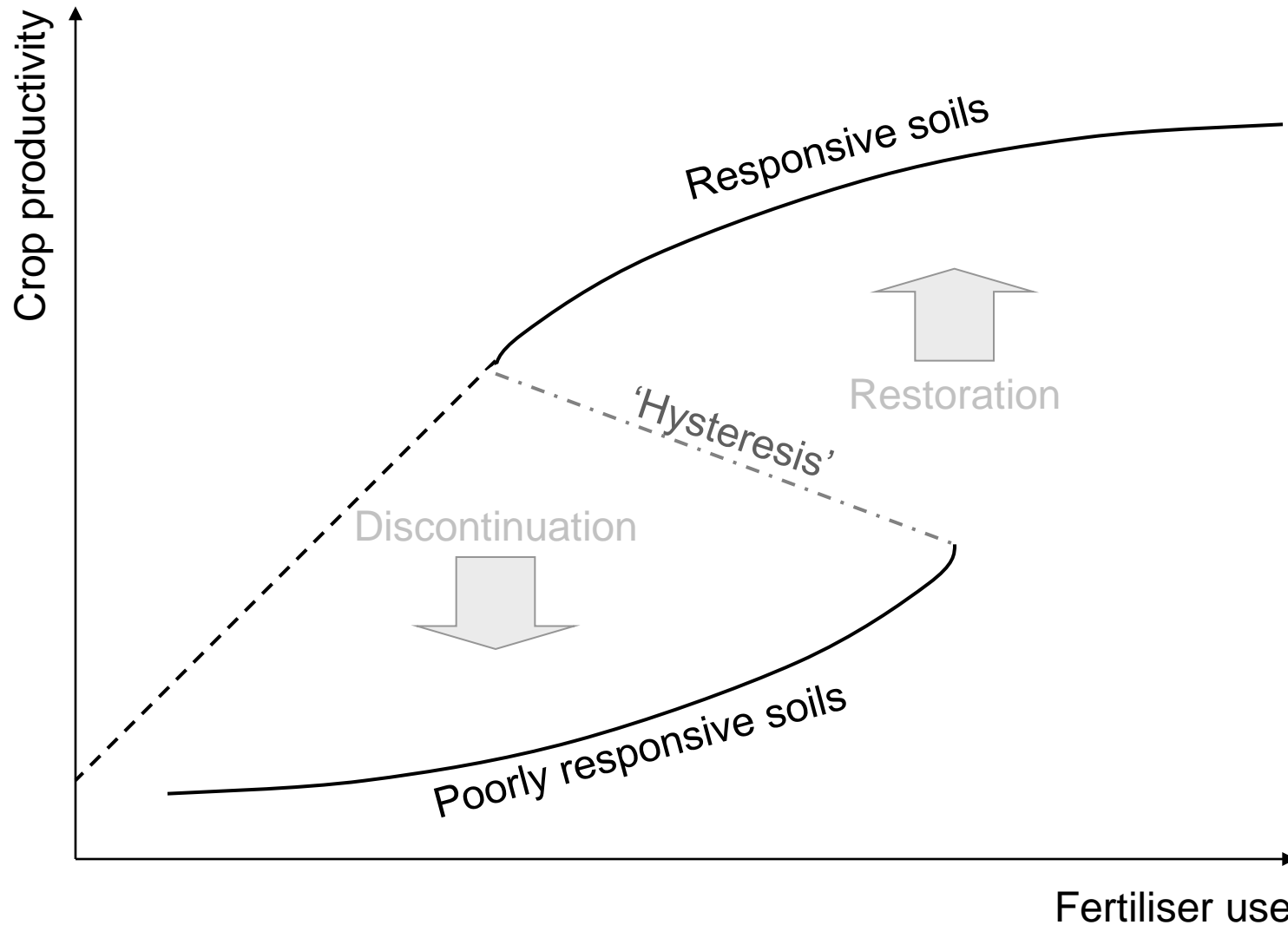


# Background

- Productivity decline in cotton-based cropping systems of West and Central Africa: impact on regional economies
- Price fluctuations lead to discontinuous/ insufficient fertiliser use in the long term: impact on soil productivity
- Cameroon National debt funds (C2D) : soil fertility restoration project (SODECOTON, CIRAD)
- What determines current yield gaps, how wide are they, and how to close them?
- Data mining: reanalysis of 'old' and long term trials

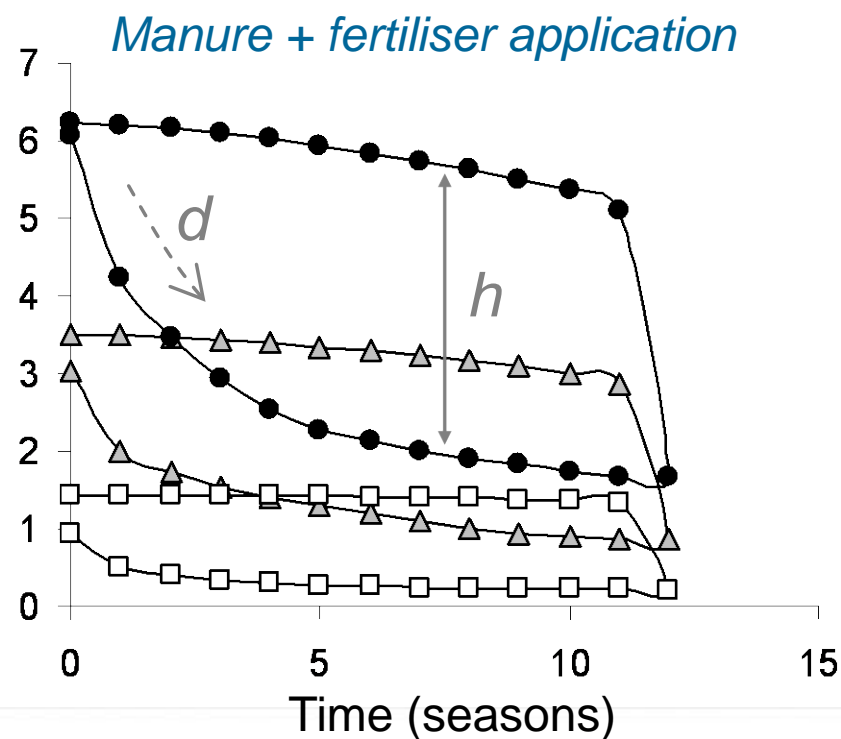
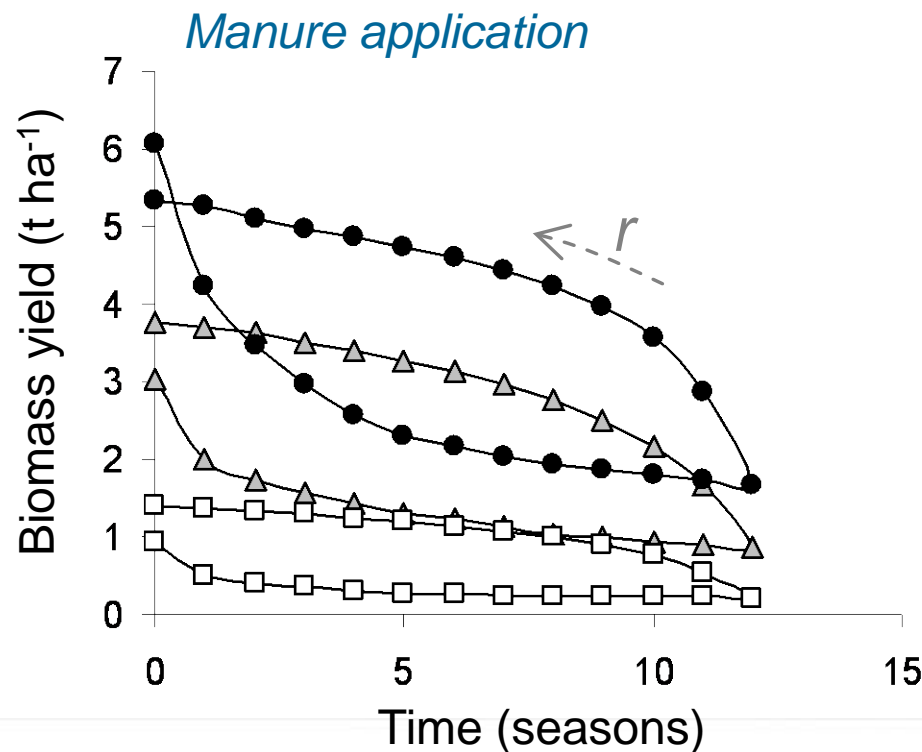
## Global fertiliser productivity at Garoua, N Cameroon







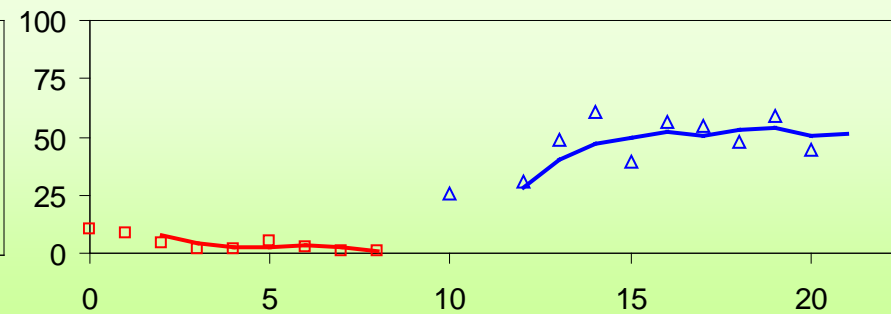
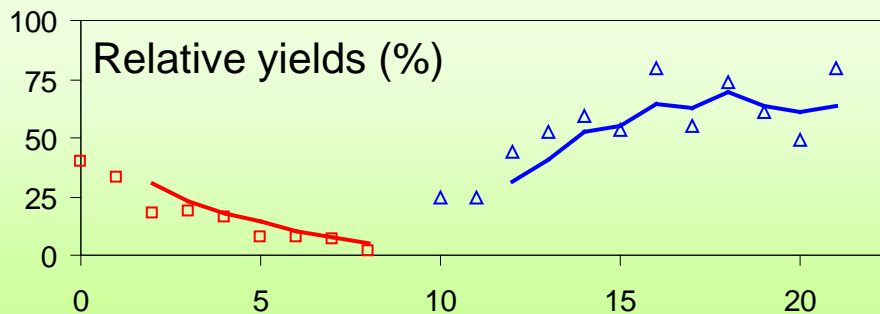
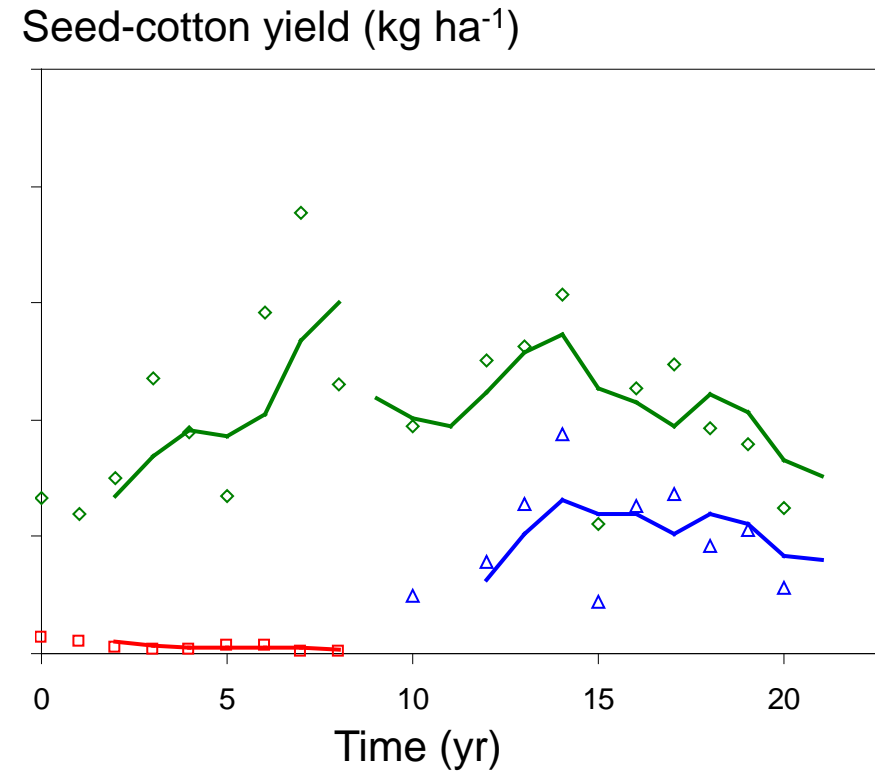
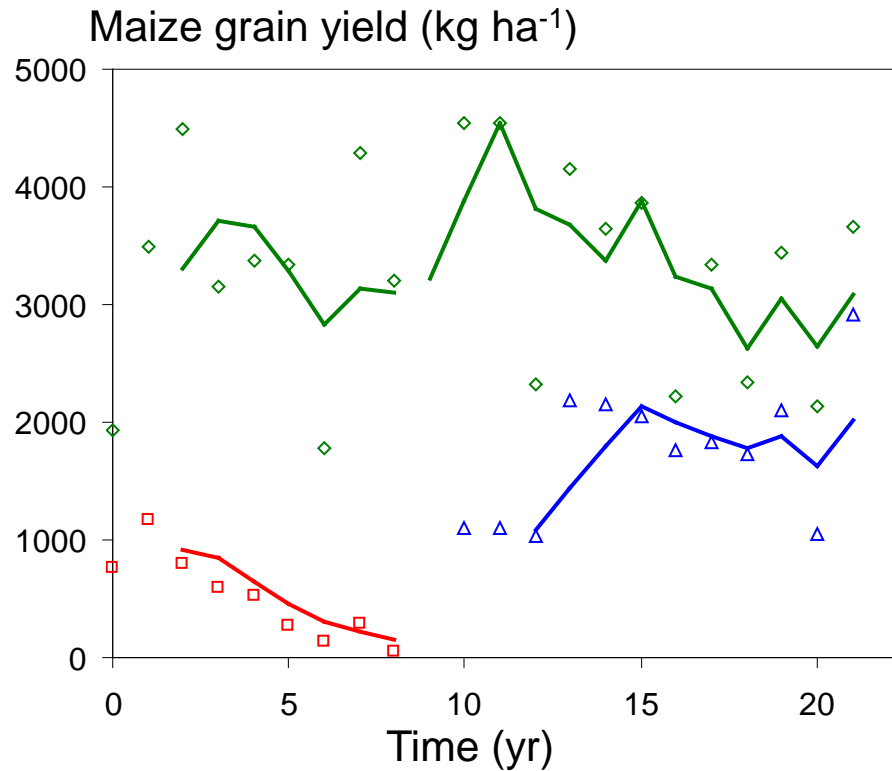
# "Hysteresis" of land rehabilitation - Kenya



*Tittonell et al., 2008, Agronomy Journal 100*

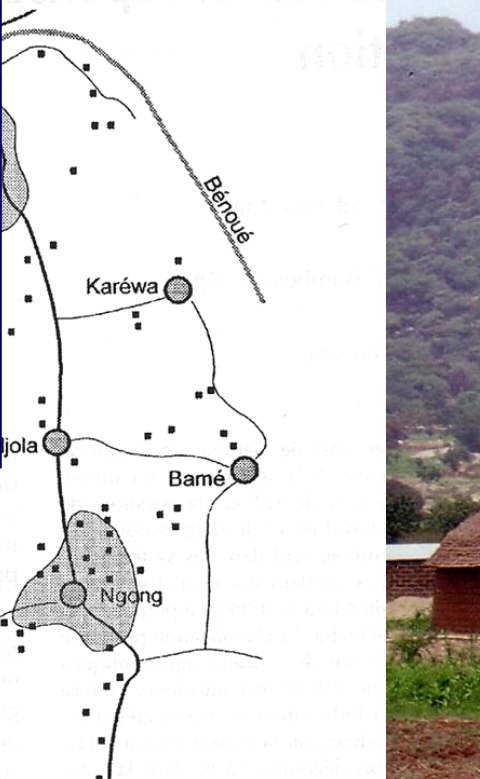
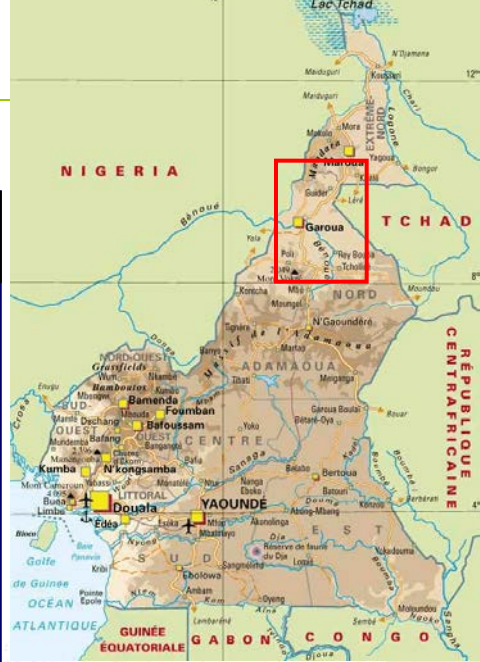
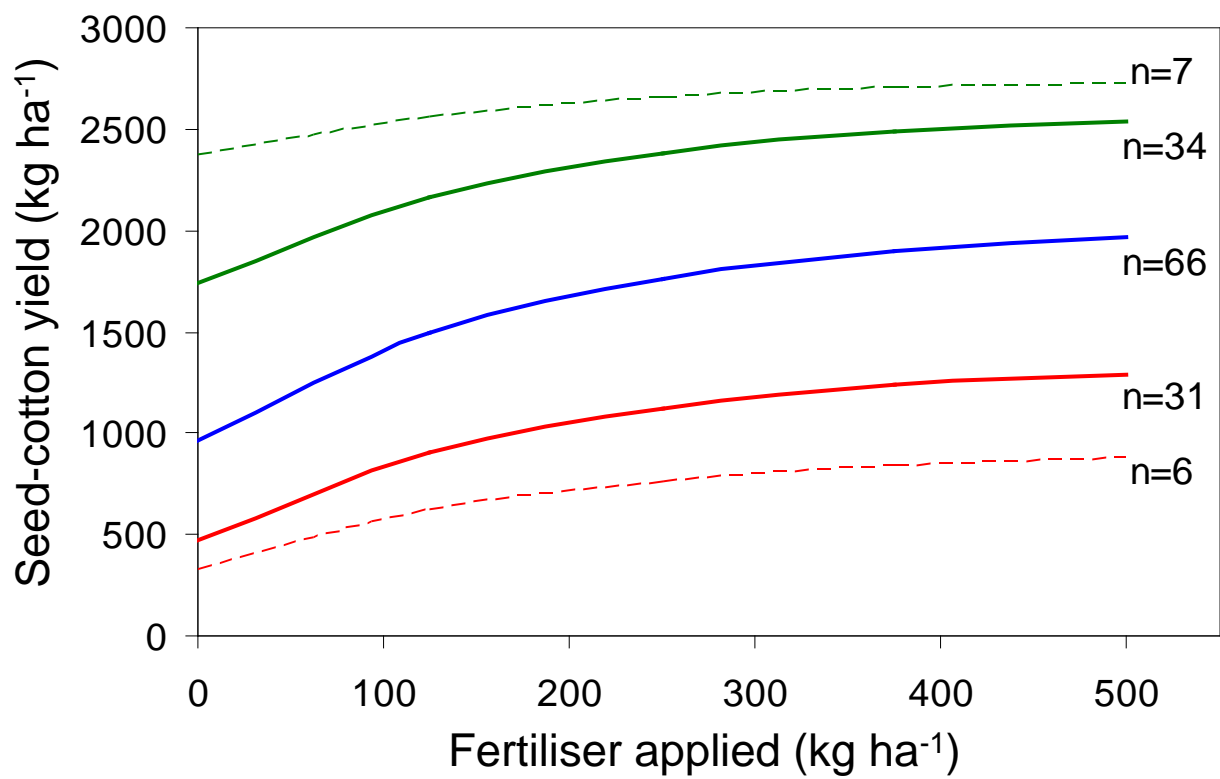


## Phases of depletion and restoration (Benin)



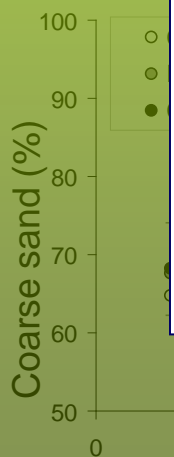
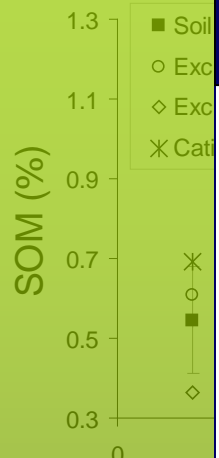
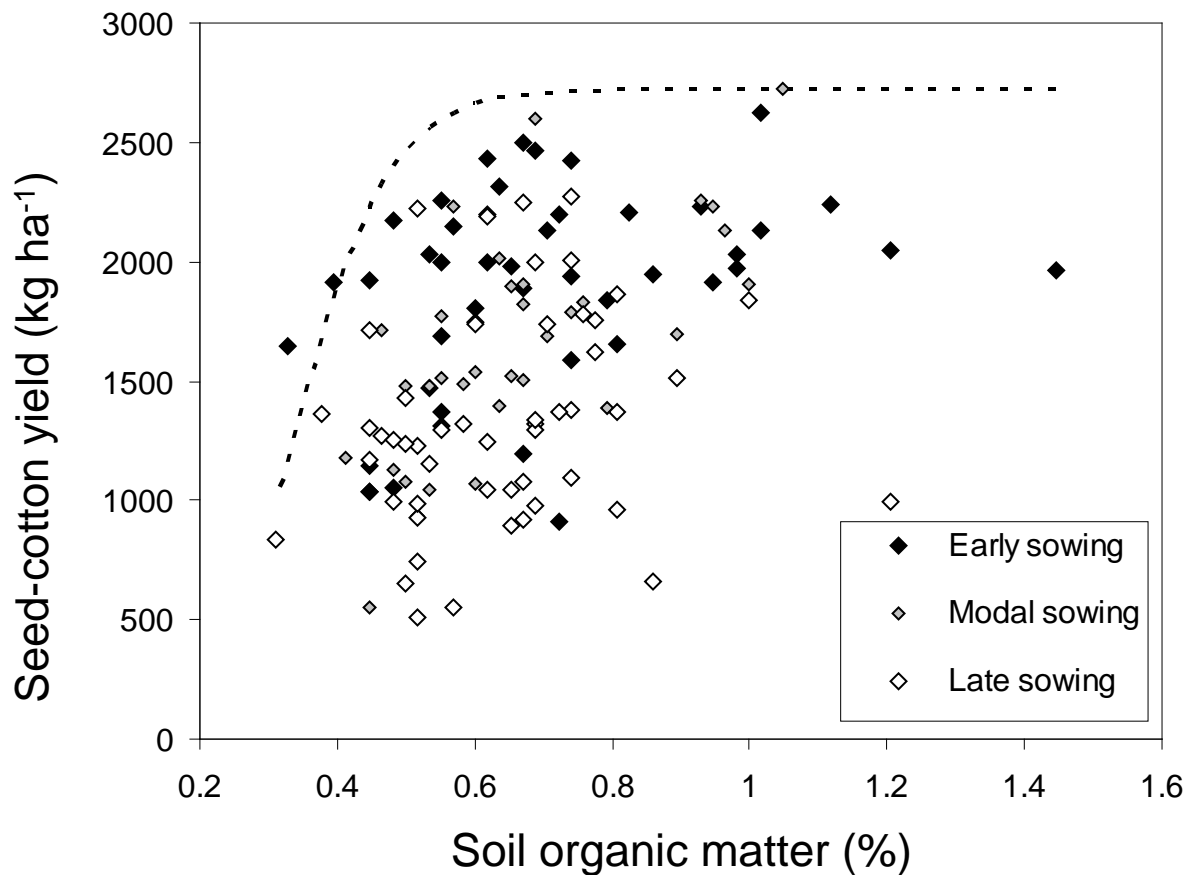
# Closing yield gaps through fertiliser use

## Response to fertiliser by cotton per quintile





## Management practices affect attainable yields



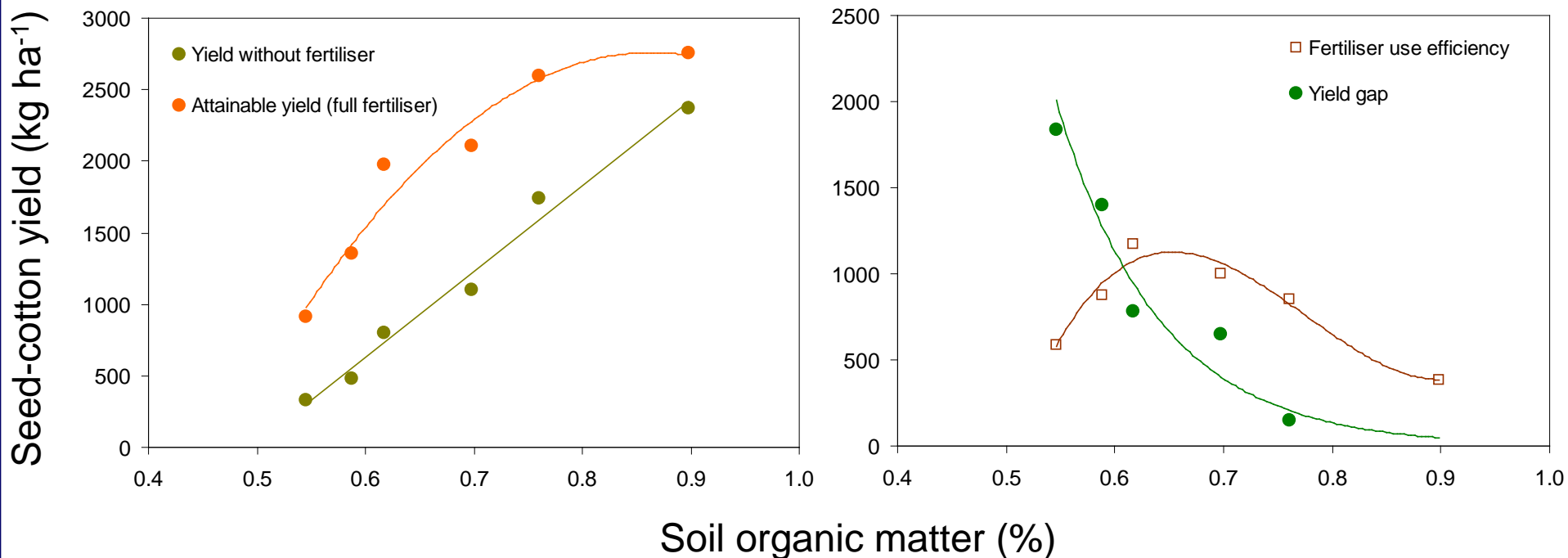
Seed-cotton yield without fertiliser (kg ha<sup>-1</sup>)



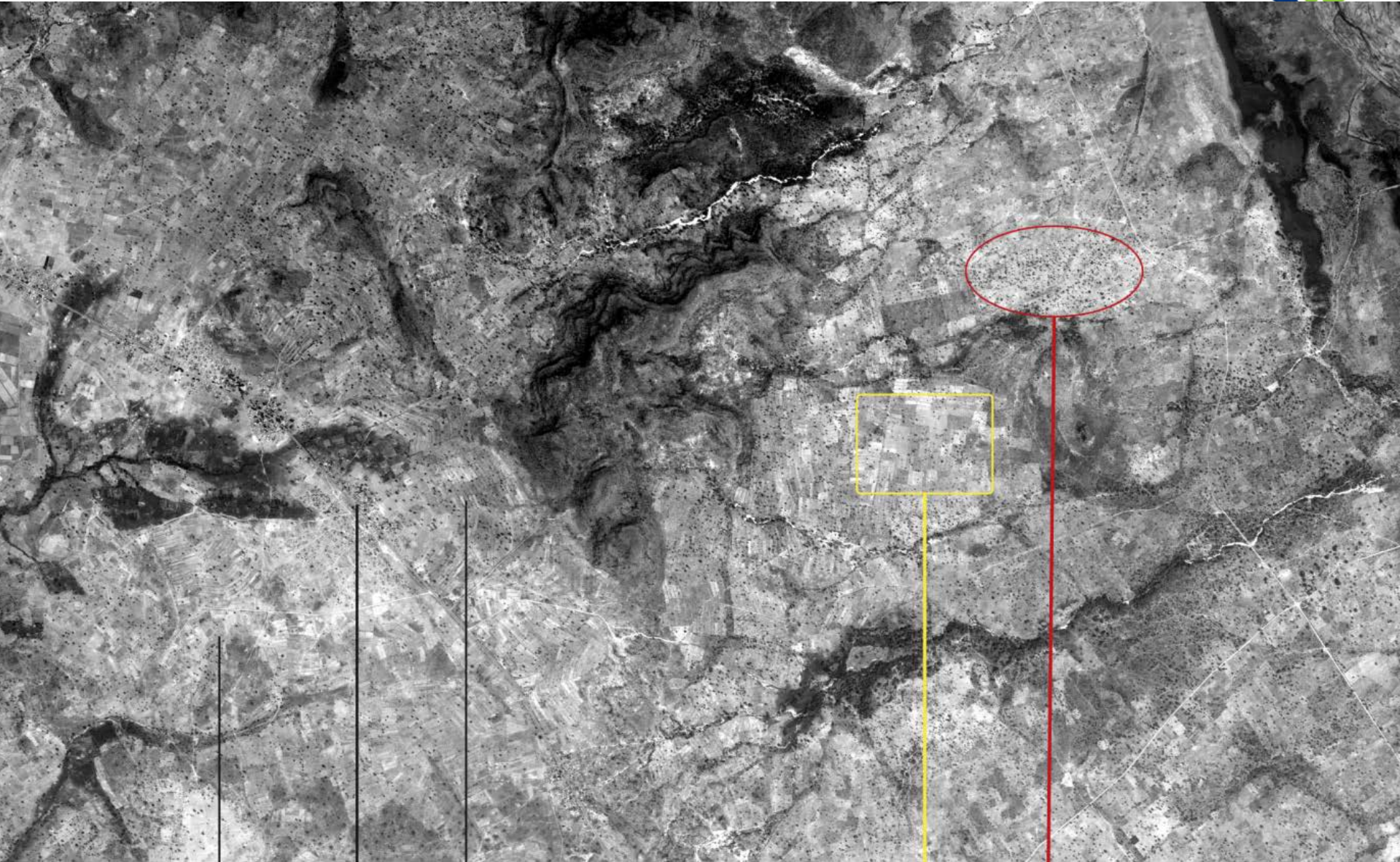
## A positive feedback

- Clearance of native savannah vegetation
- Continuous cultivation with poor C restitution

## Response parameters, efficiency, yield gaps and soil organic matter



# National policies with local consequences



champs ex-  
exploités par les  
lakas

village de  
Mafakilda

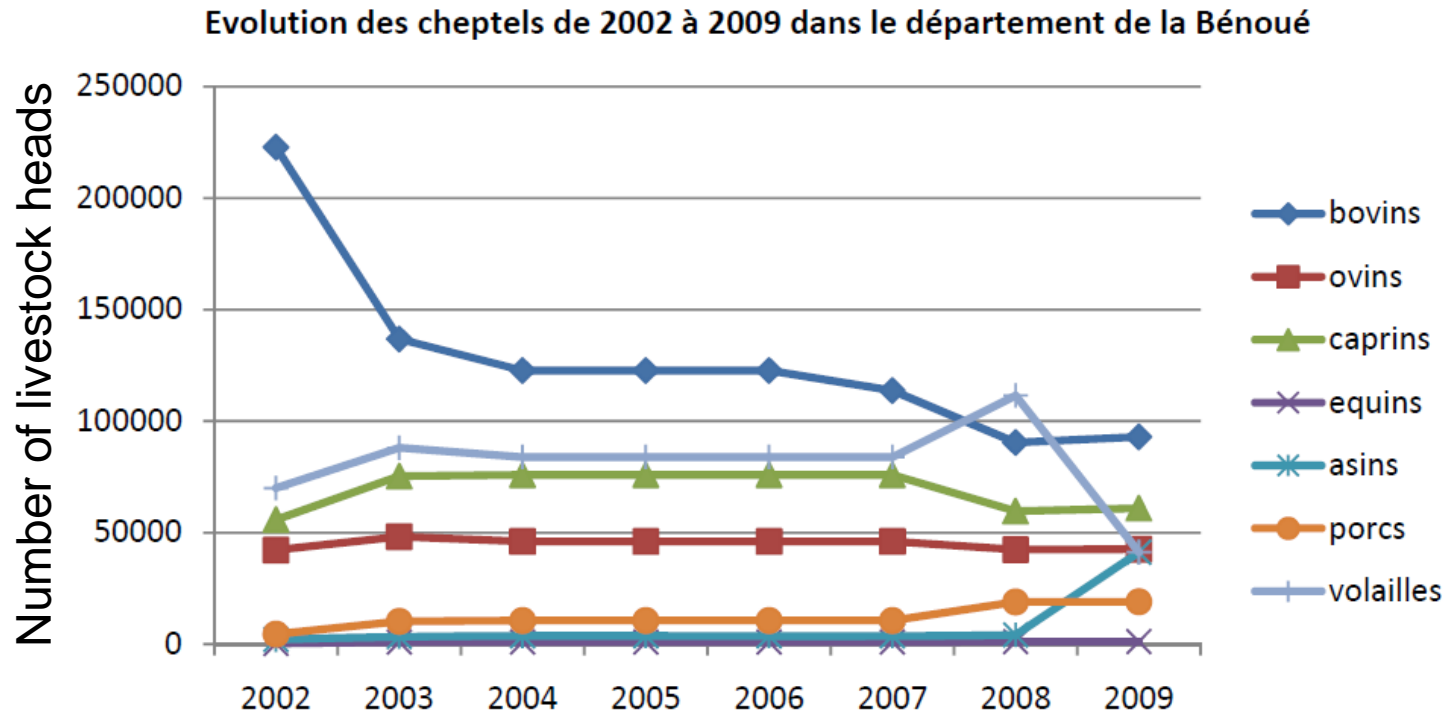
champs ex-  
exploités par  
les mafas

champs exploités  
par les mafas

champs exploités  
par les peuls : parc  
arboré



## Decline in livestock numbers



Bénoué

datchofol

Peul nomades ne pratiquant pas l'agriculture

Fixation du foyer et transhumance saisonnière des troupeaux puis défriche

Nigeria - Peul - semi nomades, déplacements pendant la campagne agricole (culture du sorgho)

Cameroun - Nakong ou Babla - même système de production

Sedentatisation de Peul à Sabewa puis Israel et v.aladji Maïssaje- culture du maïs - transhumance en fin de saison sèche et en saison des pluies, puis construction d'un village et défriche

jeunes foyers installés

diversification du système de cultures

généralement déte-laka  
venus pas les Peul  
venus par les Mafa



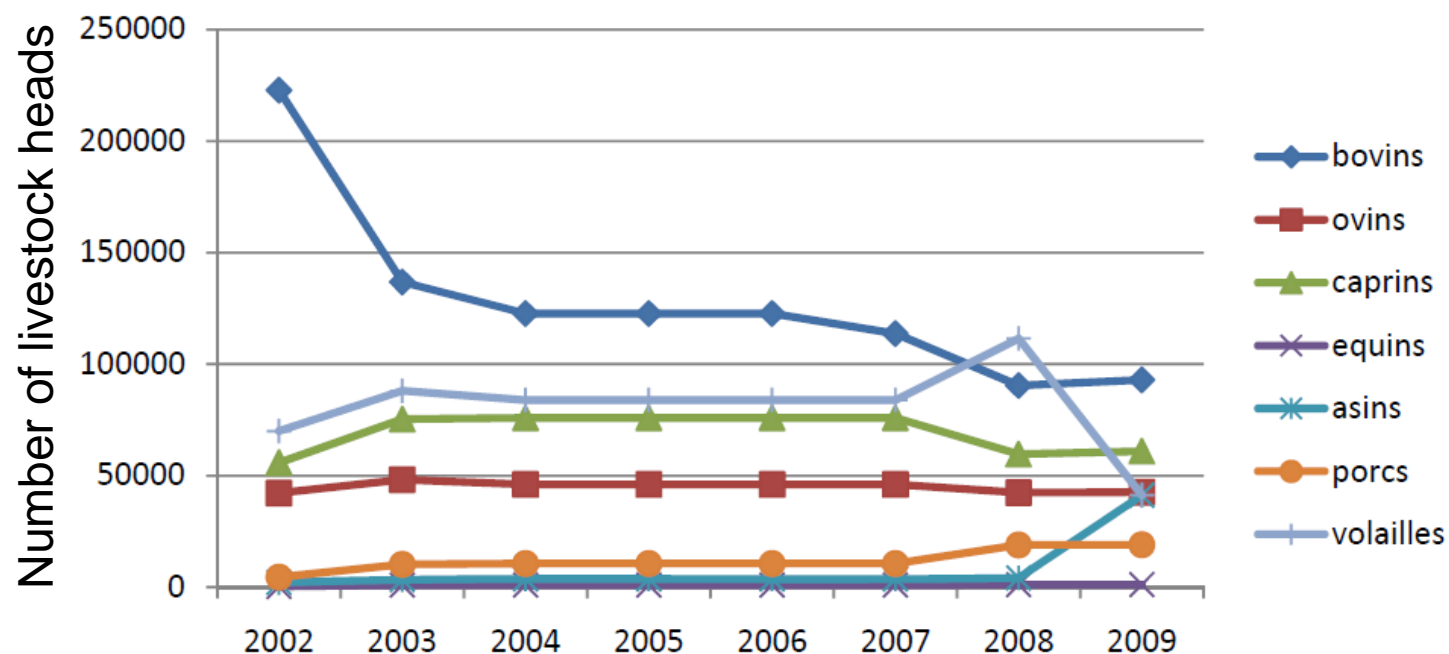
- Discontinuous/ insufficient fertiliser use widens yield gaps through cumulative effects
- Lack of reversibility in fertiliser response beyond a certain threshold of soil degradation - hystereis or *la mémoire du sol*
- Soil organic matter as key to restoring soil productivity, but complexity of local land use systems must be embraced
- Policy innovation: e.g. could policy enforce crop rotations or fallows?
- Data mining as a method to inform yield gap analysis



Thanks for your attention

## Decline in livestock numbers

Evolution des cheptels de 2002 à 2009 dans le département de la Bénoué





NORD - EST ↑

FORET NON DEFRICHEE

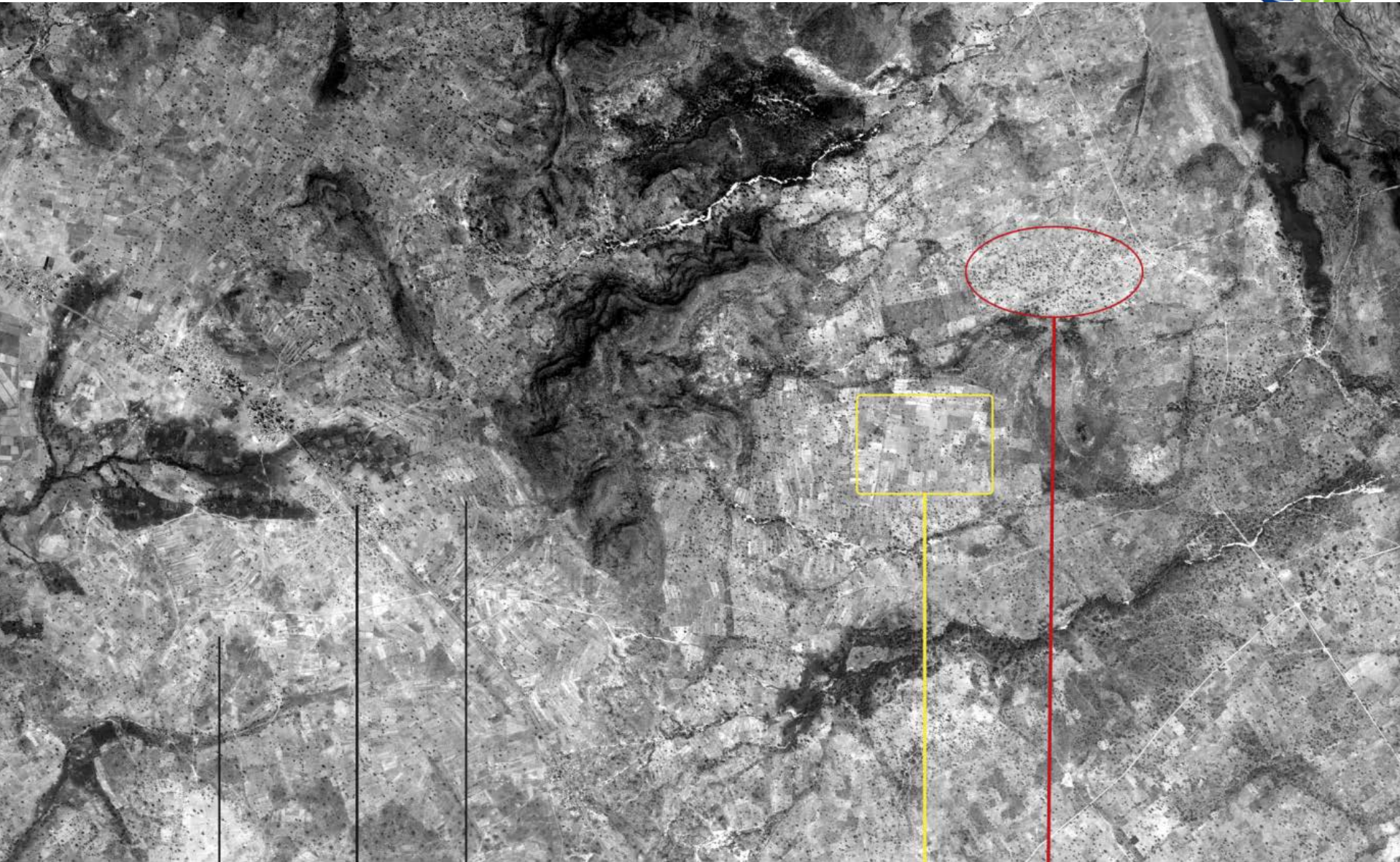
BENOUE

TERRES CULTIVEES





# National policies with local consequences



champs ex-  
ploités par les  
lakas

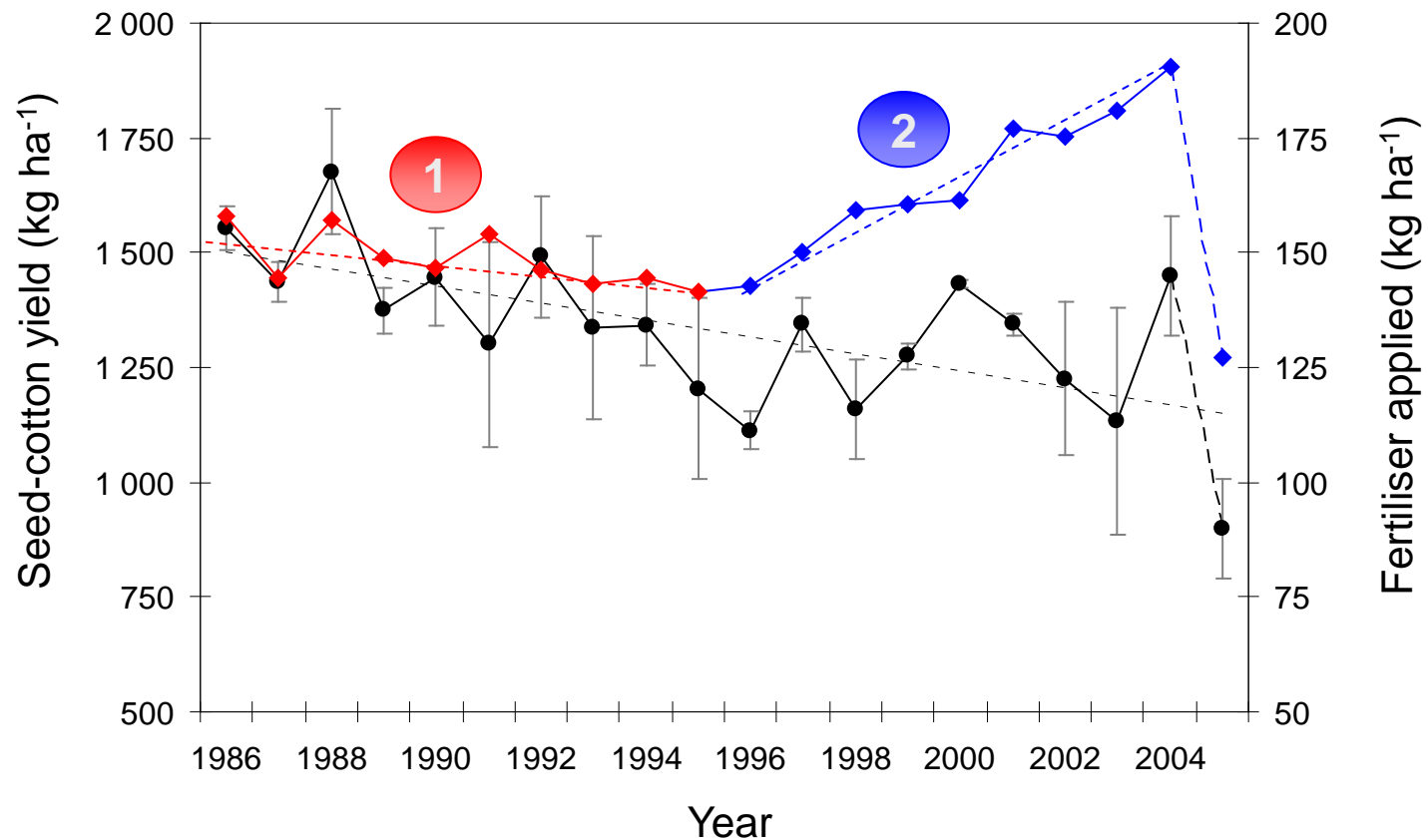
village de  
Mafakilda

champs ex-  
ploités par  
les mafas

champs exploités  
par les mafas

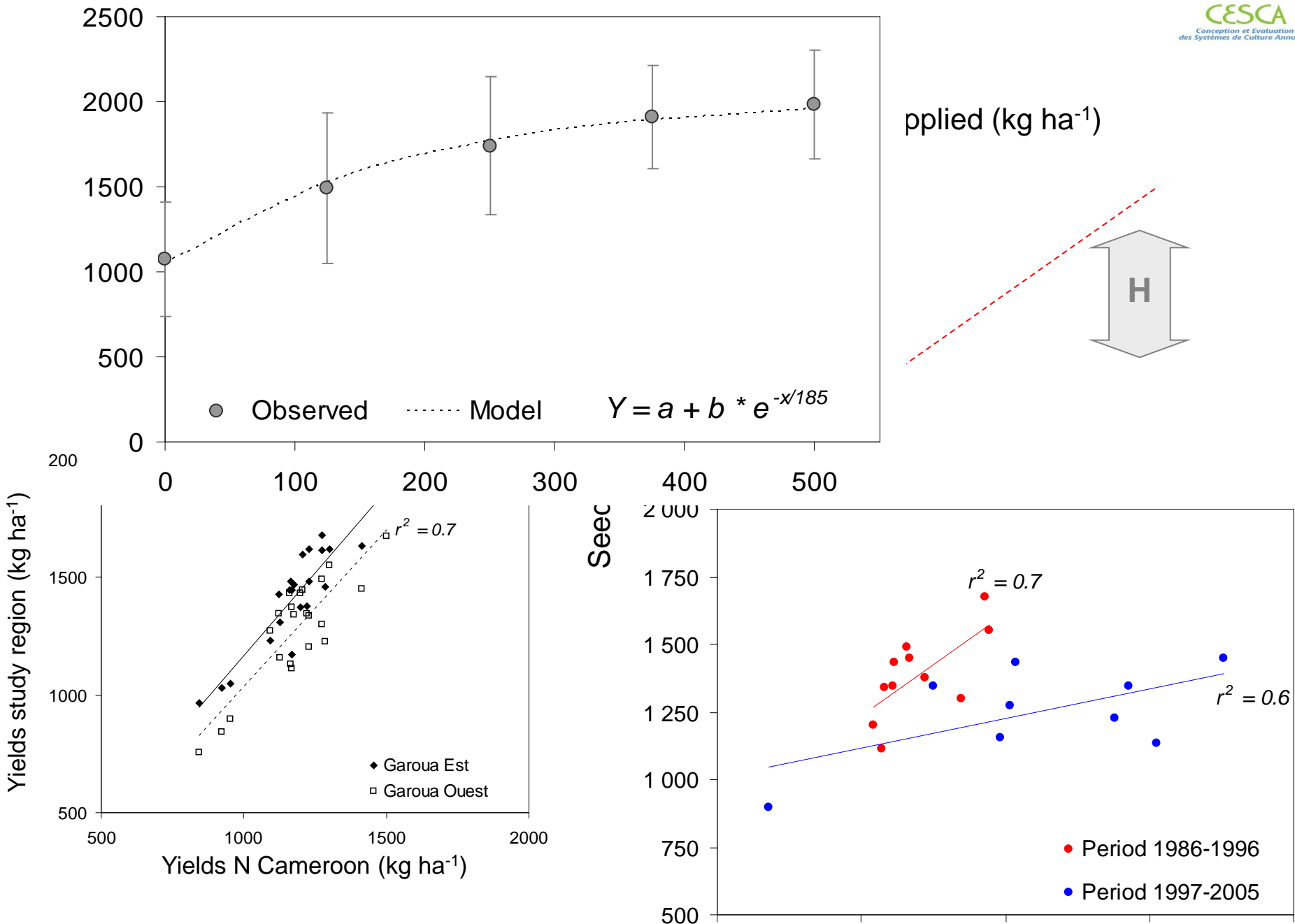
champs exploités  
par les peuls : parc  
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## Cotton yield and fertiliser use at Garoua, N Cameroon

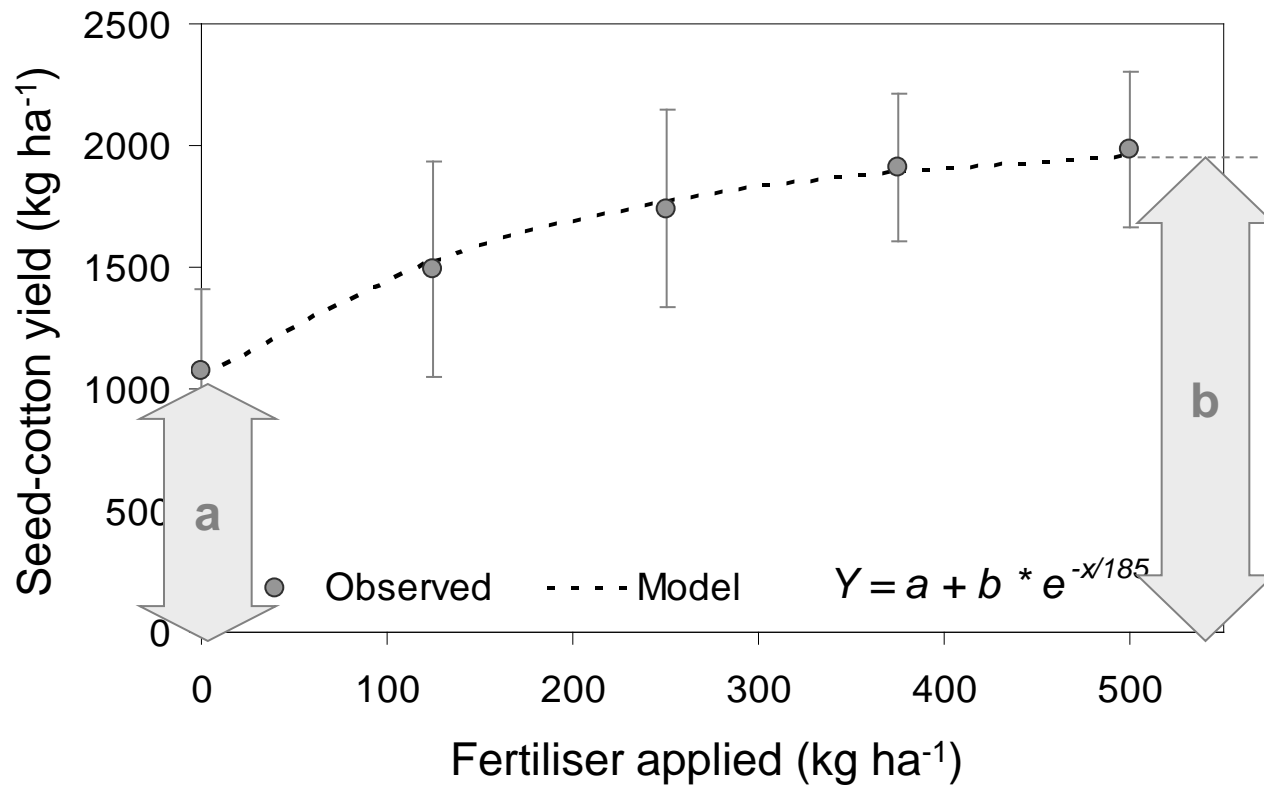




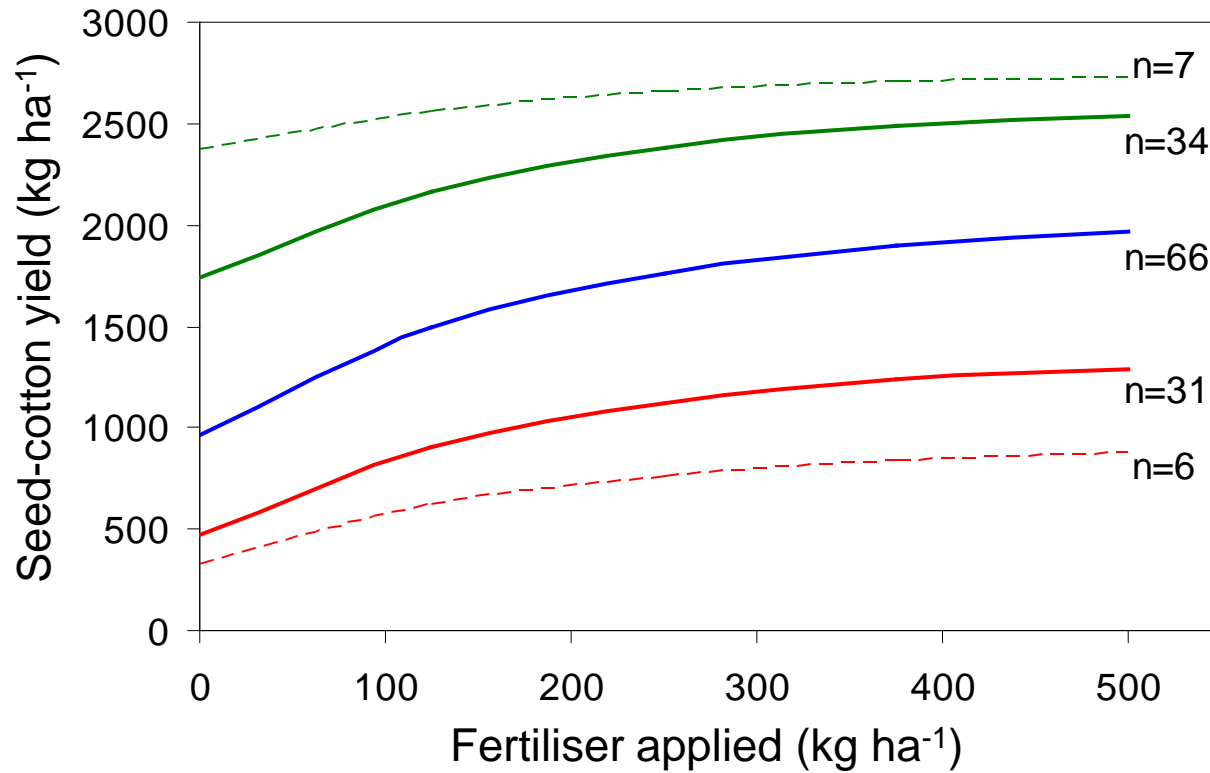
# Discontinuous fertiliser use



## Average response to fertiliser by cotton in 1990

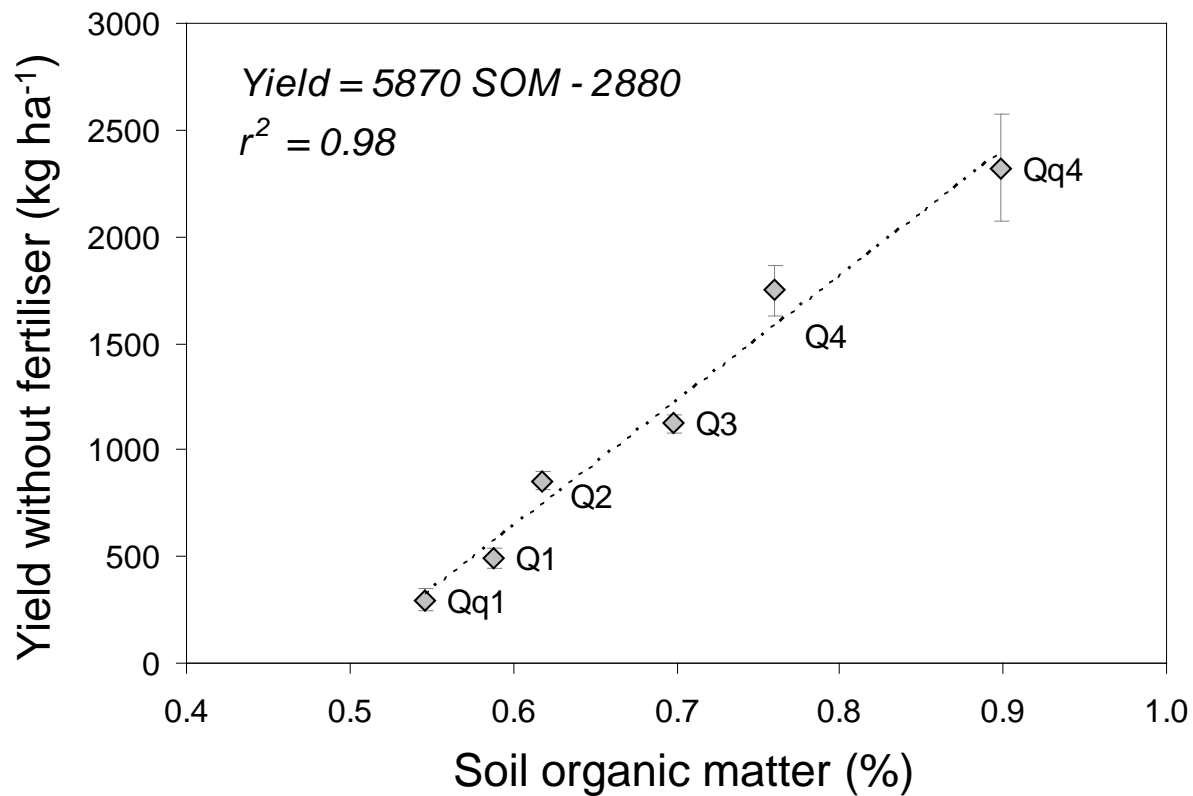


## Response to fertiliser by cotton per quintile

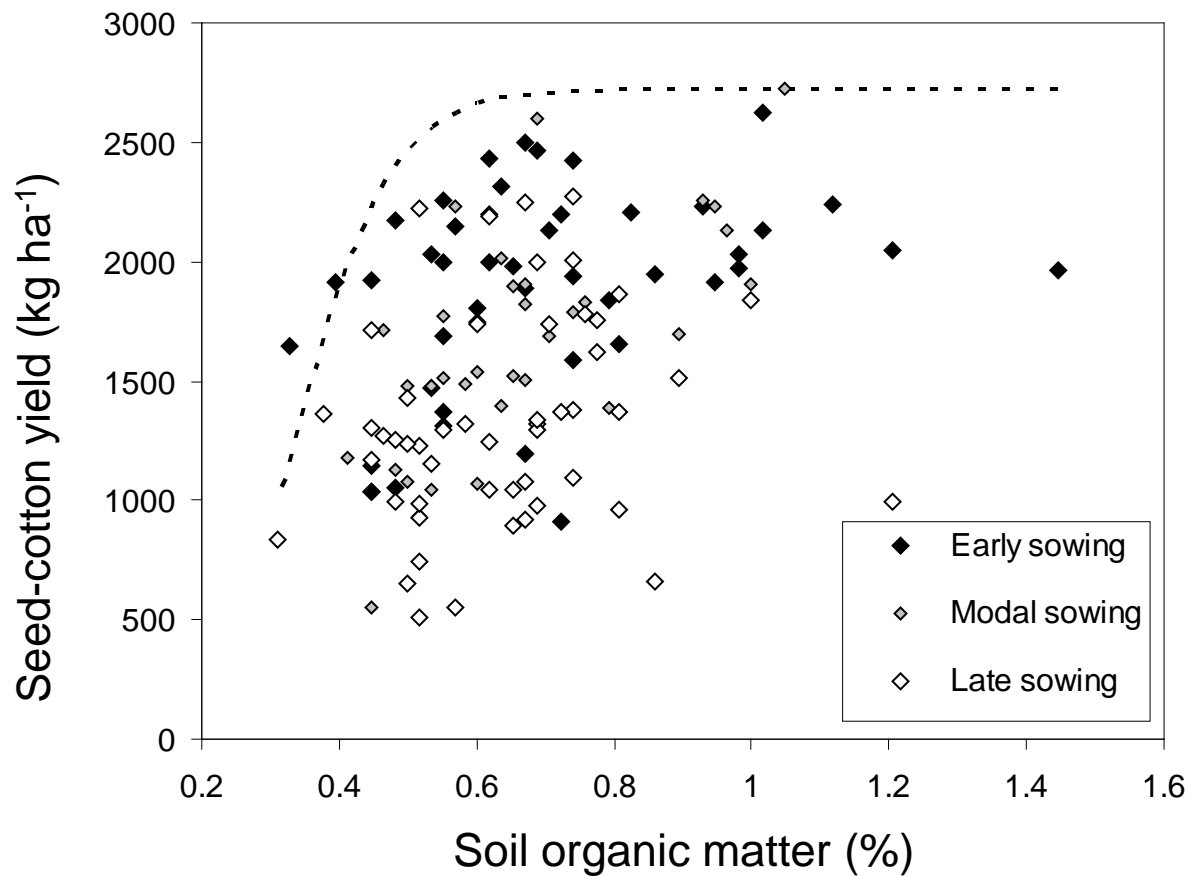




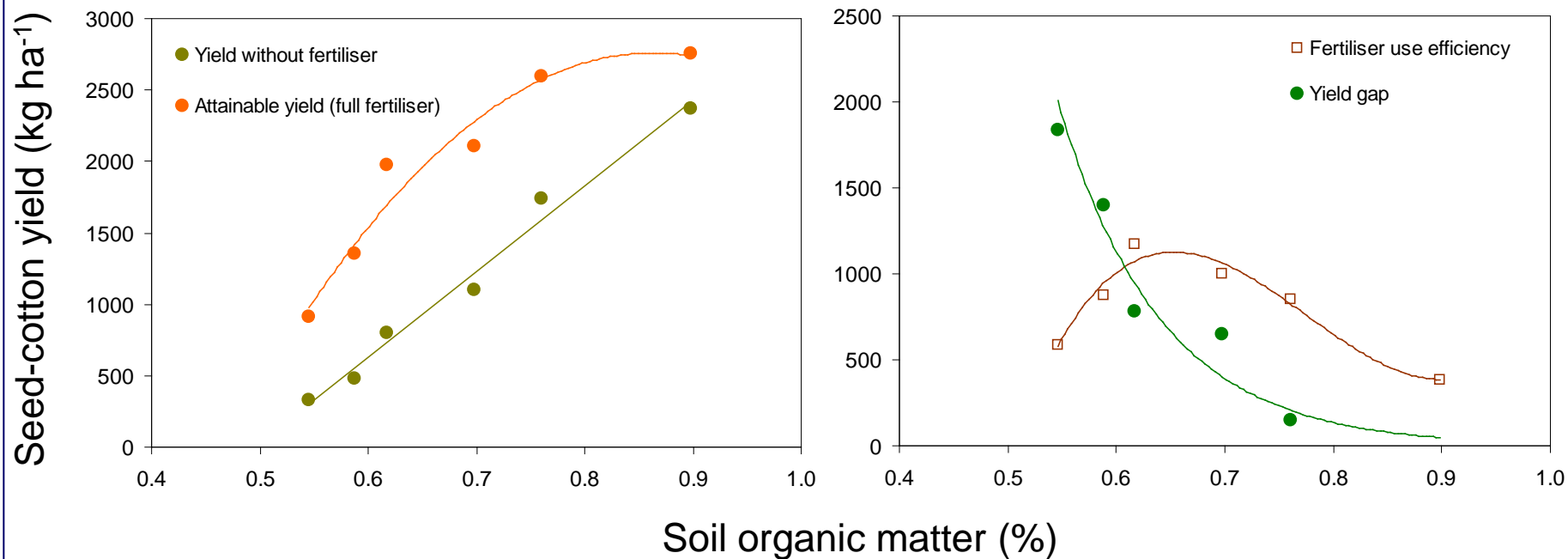
## Soil productivity without fertiliser



## Management practices affect attainable yields



## Response parameters, efficiency, yield gaps and soil organic matter





## Global fertiliser productivity at Garoua, N Cameroon

